

WHAT IS CLAIMED IS:

1. A fiber optic module comprising:  
a connector for connection with a mother board;

*a* <sup>laser diode</sup>  
~~LD~~ electric signal conversion means for  
converting serial data received from said mother board  
*a* <sup>laser diode</sup>  
to an ~~LD~~ electric signal for a laser diode;  
*a* <sup>laser diode</sup>  
an ~~LD~~ module for converting said ~~LD~~ electric  
*a* <sup>laser diode</sup>  
signal to an ~~LD~~ optical signal;  
*a* <sup>photodiode</sup>  
a ~~PD~~ module for converting a photodiode  
*a* <sup>photodiode</sup>  
optical signal to a ~~PD~~ electric signal;  
*a* <sup>photodiode</sup>  
~~PD~~ electric signal conversion means for  
*a* <sup>photodiode</sup>  
converting said ~~PD~~ electric signal to ~~PD~~ serial data;

a circuit board for carrying thereon said  
*a* <sup>laser diode</sup>  
connector, said ~~LD~~ electric signal conversion means,  
*a* <sup>laser diode</sup> <sup>photodiode</sup>  
said ~~LD~~ module and said ~~PD~~ module; and

first and second frames for holding said  
*a* <sup>laser diode</sup> <sup>photodiode</sup>  
circuit board, said ~~LD~~ module and said ~~PD~~ module,  
wherein said connector is of a surface  
mounting type.

- a* 2. A fiber optic module as set forth in claim 1,  
<sup>laser diode</sup> <sup>photodiode</sup>  
wherein leads of said ~~LD~~ and ~~PD~~ modules are connected to  
a surface of said circuit board provided thereon with  
said connector.

- a* 3. A fiber optic module as set forth in claim 2,  
<sup>laser diode</sup>  
further comprising an ~~LD~~ variable resistor for adjusting  
*a* <sup>laser diode</sup> <sup>laser diode</sup>  
a drive current of said ~~LD~~ module and wherein said ~~LD~~  
variable resistor is provided on a surface of said

circuit board opposed to said surface having said connector thereon.

a 4. A fiber optic module as set forth in claim 2,  
further comprising a <sup>photo diode</sup> ~~PD~~ variable resistor for detecting  
a signal of said <sup>photo diode</sup> ~~PD~~ module and wherein said <sup>photo diode</sup> ~~PD~~ variable resistor is provided on a surface of said circuit board opposed to said surface having said connector thereon.

B a 5. A fiber optic module as set forth in claim 1,  
wherein said <sup>photo diode</sup> ~~PD~~ electric signal conversion means includes a plurality of semiconductor <sup>integrated</sup> ~~circuits~~ <sup>circuits</sup>.

6. A fiber optic module as set forth in claim 1, wherein said circuit board measures 17mm through 25.4mm wide, 30mm through and 50mm long.

7. A fiber optic module comprising:  
a connector for connection with a mother board;

a <sup>laser diode</sup> ~~LD~~ electric signal conversion means for converting serial data received from said mother board to an <sup>laser diode</sup> ~~LD~~ electric signal for a laser diode;

a an <sup>laser diode</sup> ~~LD~~ module for converting said <sup>laser diode</sup> ~~LD~~ electric signal to an <sup>laser diode</sup> ~~LD~~ optical signal;

a a <sup>photo diode</sup> ~~PD~~ module for converting a photodiode optical signal to a <sup>photo diode</sup> ~~PD~~ electric signal;

a <sup>photo diode</sup> ~~PD~~ electric signal conversion means for converting said <sup>photo diode</sup> ~~PD~~ electric signal to <sup>photo diode</sup> ~~PD~~ serial data;

a a circuit board for carrying thereon said connector, said <sup>laser diode</sup> ~~LD~~ electric signal conversion means, said <sup>laser diode</sup> ~~LD~~ module and said <sup>photo diode</sup> ~~PD~~ module; and

a first and second frames for holding said circuit board, said <sup>laser diode</sup>LD module and said <sup>photodiode</sup>PD module,

wherein outline dimensions of said fiber optic module are 19mm through 25.4mm wide, 45mm through 65mm high and 9mm through 25.4mm high.

8. A fiber optic module as set forth in claim 7, further comprising a casing, said casing comprising said first and second frames forms an outside casing.

9. A fiber optic module as set forth in claim 7, wherein said first and second frames are made of resin material.

10. A fiber optic module comprising:  
a connector for connection with a mother board;

a <sup>laser diode</sup>  
LD electric signal conversion means for converting serial data received from said mother board to an <sup>laser diode</sup>LD electric signal for a laser diode;

a <sup>laser diode</sup>  
an LD module for converting said <sup>laser diode</sup>LD electric signal to an <sup>laser diode</sup>LD optical signal;

a <sup>photodiode</sup>  
a PD module for converting a photodiode optical signal to a <sup>photodiode</sup>PD electric signal;

a <sup>photodiode</sup>  
PD electric signal conversion means for converting said <sup>photodiode</sup>PD electric signal to <sup>photodiode</sup>PD serial data;

a a circuit board for carrying thereon said connector, said <sup>laser diode</sup>LD electric signal conversion means, said <sup>laser diode</sup>LD module and said <sup>photodiode</sup>PD module; and

a first and second frames for holding said circuit board, said <sup>laser diode</sup>LD module and said <sup>photodiode</sup>PD module,

wherein said module comprises mounting means for mounting said first and second frames to said mother board.

~~11.~~ A fiber optic module as set forth in claim 10, wherein said mounting means includes a screw.

~~12.~~ A fiber optic module as set forth in claim 11, further comprising a first frame openings provided in said first frame, a second frame openings provided in said second frame, a circuit board openings provided in said circuit board, and a mother board openings provided in said mother board, and wherein screws are inserted into said first openings, second frame openings, said circuit board openings and said mother board openings to cause said first frame, said second frame, said circuit board and said mother board to be mutually fixed.

~~13.~~ A fiber optic module as set forth in claim 12, wherein said first frame openings is smaller than said second frame openings and said circuit board openings and said mother board openings have substantially the same diameter as said second frame opening.

~~14.~~ A fiber optic module as set forth in claim 10, wherein said screws have an effective diameter of 1.3mm or more.

~~15.~~ A fiber optic module as set forth in claim 12, wherein 3 of said first frame openings are provided in said first frame and said first frame openings are arranged to form a substantially isosceles triangle.

~~16.~~ A fiber optic module as set forth in claim 12,

wherein said first frame openings are used also as reference holes for parts inspection of said first frame and said second frame openings are used also as reference holes for parts inspection of said second frame.

17. A fiber optic module as set forth in claim 11, wherein said screws are tapping screws.

18. A fiber optic module as set forth in claim 10, wherein pins erected on at least one of said first and second frames are used as said mounting means.

19. A fiber optic module as set forth in claim 18, wherein pins erected only on said second frame are used as said mounting means.

20. A fiber optic module as set forth in claim 19, further comprising first frame openings provided in said first frame, a circuit board openings provided in said circuit board, and a mother board openings provided in said mother board, and wherein screws are inserted into said first frame openings, said circuit board openings and said mother board openings to cause said first frame, said circuit board and said mother board to be mutually fixed.

21. A fiber optic module as set forth in claim 20, wherein said first frame openings are larger than a diameter of said pin and said circuit board openings and said mother board openings have substantially the same diameter as said first frame openings.

22. A fiber optic module as set forth in claim 19,

wherein said pin has a diameter of 1.3mm or more.

23. A fiber optic module as set forth in claim 19, wherein said pin is made of metallic material.

24. A fiber optic module as set forth in claim 19, wherein said pin is integrally formed with said second frame or press fitted therein.

25. A fiber optic module as set forth in claim 20, wherein 3 of said first frame openings are provided in said first frame and said first frame openings are arranged to form a substantially isosceles triangle.

26. A fiber optic module as set forth in claim 20, wherein said first frame openings are used also as reference holes for parts inspection of said first frame and said pins are used also as reference holes for parts inspection of said second frame.

27. A fiber optic module comprising:  
a connector for connection with a mother board;

a *laser diode*  
~~LD~~ electric signal conversion means for converting serial data received from said mother board to an LD electric signal for a laser diode;

a *laser diode*  
an ~~LD~~ module for converting said *laser diode* ~~LD~~ electric signal to an *laser diode* ~~LD~~ optical signal;

a *photodiode*  
a ~~PD~~ module for converting a photodiode optical signal to a *photodiode* ~~PD~~ electric signal;

a *photodiode*  
~~PD~~ electric signal conversion means for converting said *photodiode* ~~PD~~ electric signal to *photodiode* ~~PD~~ serial data;

a circuit board for carrying thereon said

connector, said <sup>laser diode</sup>LD, electric signal conversion means,  
said <sup>laser diode</sup>LD module and said <sup>photodiode</sup>PD module; and

first and second frames for holding said  
circuit board, said <sup>laser diode</sup>LD module and said <sup>photo diode</sup>PD module,

wherein said circuit board is temporarily  
fixed to at least one of said first and second frames.

28. A fiber optic module as set forth in claim 27,  
wherein said temporary fixing means is a snap-fit  
mechanism.

29. A fiber optic module as set forth in claim 28,  
wherein said circuit board is temporarily fixed at an  
end thereof by said snap-fit mechanism.

30. A fiber optic module as set forth in claim 27,  
wherein an elastic arm is provided to at least one of  
said first and second frames and said circuit board is  
temporarily fixed to the other frame by said elastic  
arm.

31. A fiber optic module as set forth in claim 27,  
wherein said circuit board is temporarily fixed at a  
front part thereof by a snap-fit mechanism and said  
circuit board is temporarily fixed to the other frame at  
a rear part thereof by an elastic arm.

32. A fiber optic module comprising:  
a connector for connection with a mother  
board;

<sup>laser diode</sup>  
~~LD~~ electric signal conversion means for  
converting serial data received from said mother board  
to an LD electric signal for a laser diode;

a an ~~LD~~ <sup>laser diode</sup> module for converting said ~~LD~~ <sup>laser diode</sup> electric  
a signal to an ~~LD~~ <sup>laser diode</sup> optical signal;  
a a ~~PD~~ <sup>photodiode</sup> module for converting a photodiode (~~PD~~)  
a optical signal to a ~~PD~~ <sup>photodiode</sup> electric signal;  
a ~~PD~~ <sup>photodiode</sup> electric signal conversion means for  
a converting said ~~PD~~ <sup>photodiode</sup> electric signal to ~~PD~~ <sup>photodiode</sup> serial data;

a a circuit board for carrying thereon said  
a connector, said ~~LD~~ <sup>laser diode</sup> electric signal conversion means,  
a said ~~LD~~ <sup>laser diode</sup> module and said ~~PD~~ <sup>photodiode</sup> module; and

a first and second frames for holding said  
circuit board, said ~~LD~~ <sup>laser diode</sup> module and said ~~PD~~ <sup>photodiode</sup> module,

wherein said module further comprises  
supporting means for tightening to fix said first and  
second frames and said mother board from their outer  
periphery.

33. A fiber optic module as set forth in claim 32,  
wherein said supporting means is made of metallic plate.

34. A fiber optic module as set forth in claim 33,  
wherein said metallic plate is provided in its both ends  
with recesses and said recesses are rotated to  
tighteningly fix said metallic plate.

35. A fiber optic module as set forth in claim 32,  
wherein said supporting means is positioned at a  
position opposed to said ~~LD~~ <sup>laser diode</sup> and ~~PD~~ <sup>photodiode</sup> modules.

36. A fiber optic module comprising:  
a connector for connection with a mother  
board;

~~LD~~ <sup>laser diode</sup> electric signal conversion means for



converting serial data received from said mother board  
a to an ~~LD~~ <sup>laser diode</sup> electric signal for a laser diode;  
a an ~~LD~~ <sup>laser diode</sup> module for converting said ~~LD~~ <sup>laser diode</sup> electric  
a signal to an ~~LD~~ <sup>laser diode</sup> optical signal;  
a a ~~PD~~ <sup>photodiode</sup> module for converting a photodiode  
a optical signal to a ~~PD~~ <sup>photodiode</sup> electric signal;  
a ~~PD~~ <sup>photodiode</sup> electric signal conversion means for  
a converting said ~~PD~~ <sup>photodiode</sup> electric signal to ~~PD~~ <sup>photodiode</sup> serial data;  
a a circuit board for carrying thereon said  
a connector, said ~~LD~~ <sup>laser diode</sup> electric signal conversion means,  
a said ~~LD~~ <sup>laser diode</sup> module and said ~~PD~~ <sup>photodiode</sup> module; and  
a first and second frames for holding said  
a circuit board, said ~~LD~~ <sup>laser diode</sup> module and said ~~PD~~ <sup>photodiode</sup> module,  
wherein said module further includes a cover  
for covering an externally exposed part of said circuit  
board therewith.  
37. A fiber optic module as set forth in claim 36,  
wherein said cover is made of resin material.  
38. A fiber optic module as set forth in claim 36,  
wherein said cover is made of metallic material.  
39. A fiber optic module as set forth in claim 36,  
wherein said cover is made in the form of said first  
frame.  
40. A fiber optic module as set forth in claim 36,  
wherein said cover is provided therein with an opening.  
41. A fiber optic module comprising:  
a connector for connection with a mother  
board;

*a* ~~LD~~<sup>laser diode</sup> electric signal conversion means for converting serial data received from said mother board

*a* to an ~~LD~~<sup>laser diode</sup> electric signal for a laser diode;

*a* an ~~LD~~<sup>laser diode</sup> module for converting said ~~LD~~<sup>laser diode</sup> electric signal to an ~~LD~~<sup>laser diode</sup> optical signal;

*a* a ~~PD~~<sup>photodiode</sup> module for converting a photodiode optical signal to a ~~PD~~<sup>photodiode</sup> electric signal;

*a* ~~PD~~<sup>photodiode</sup> electric signal conversion means for converting said ~~PD~~<sup>photodiode</sup> electric signal to ~~PD~~<sup>photodiode</sup> serial data;

*a* a circuit board for carrying thereon said connector, said ~~LD~~<sup>laser diode</sup> electric signal conversion means, said ~~LD~~<sup>laser diode</sup> module and said ~~PD~~<sup>photodiode</sup> module; and

*a* first and second frames for holding said circuit board, said ~~LD~~<sup>laser diode</sup> module and said ~~PD~~<sup>photodiode</sup> module,

wherein said module further comprises indication parts indicative of a safety certification and a place of production provided respectively onto said first and second frames.

42. A fiber optic module as set forth in claim 41, wherein said indication part provided onto said first frame is opposed to said indication part provided onto said second frame.

43. A fiber optic module as set forth in claim 42, wherein said first and second frames have a recess and said indication parts are provided to said recesses.

44. A fiber optic module as set forth in claim 41, wherein said indication parts are seal labels.

45. A fiber optic module as set forth in claim 41,

wherein said indication parts are provided integrally to said first and second frames respectively.

46. A fiber optic module comprising:  
a connector for connection with a mother board;

*laser diode*  
an ~~LD~~ electric signal conversion means for converting serial data received from said mother board to an ~~LD~~ electric signal for a *laser diode*;

*laser diode*  
an ~~LD~~ module for converting said ~~LD~~ electric signal to an ~~LD~~ optical signal; *laser diode*

*photodiode*  
a ~~PD~~ module for converting a photodiode optical signal to a ~~PD~~ electric signal; *photodiode*

*photodiode*  
an electric signal conversion means for converting said ~~PD~~ electric signal to ~~PD~~ serial data; *photodiode*

a circuit board for carrying thereon said connector, said ~~LD~~ electric signal conversion means, said ~~LD~~ module and said ~~PD~~ module; and *laser diode* *photodiode*

first and second frames for holding said circuit board, said ~~LD~~ module and said ~~PD~~ module, *laser diode* *photodiode*

wherein a data transmission rate of said optical signal is 130 Mbits/s or more.

47. A fiber optic module as set forth in claim 46, wherein the data transmission rate of said optical signal is 200 Mbits/s or more.

48. A fiber optic module as set forth in claim 46, wherein the data transmission rate of said optical signal is 500 Mbits/s or more.

49. A fiber optic module as set forth in claim 46,

wherein the data transmission rate of said optical signal is 1000 Mbits/s or more.

50. A fiber optic module comprising:  
a connector for connection with a mother board;

a *laser diode*  
~~LD~~ electric signal conversion means for  
converting serial data received from said mother board  
a *laser diode*  
to an ~~LD~~ electric signal for a laser diode;  
a *laser diode*  
an ~~LD~~ module for converting said *laser diode* ~~LD~~ electric  
a *laser diode*  
signal to an ~~LD~~ optical signal;  
a *photodiode*  
a ~~PD~~ module for converting a photodiode  
a *photodiode*  
optical signal to a ~~PD~~ electric signal;  
a *photodiode*  
~~PD~~ electric signal conversion means for  
a *photodiode*  
converting said PD electric signal to ~~PD~~ serial data;  
a circuit board for carrying thereon said  
connector, said *laser diode* ~~LD~~ electric signal conversion means,  
a *laser diode* *photodiode*  
said ~~LD~~ module and said ~~PD~~ module; and

a  
first and second frames for holding said  
circuit board, said *laser diode* ~~LD~~ module and said *photodiode* ~~PD~~ module,

wherein said fiber optic module further  
includes a module cap to be inserted into light outlet  
and inlet openings defined by said first and second  
frames along a light inlet and outlet direction.

51. A fiber optic module as set forth in claim 50,  
wherein said module cap has cap fixing means engaged  
with part of said first and second frames and fixed to  
at least one of said first and second frames.

52. A fiber optic module comprising:

a connector for connection with a mother board;

a <sup>laser diode</sup>  
~~LD~~ electric signal conversion means for converting serial data received from said mother board to an <sup>laser diode</sup> ~~LD~~ electric signal for a laser diode;

a <sup>laser diode</sup>  
an ~~LD~~ module for converting said <sup>laser diode</sup> ~~LD~~ electric signal to an <sup>laser diode</sup> ~~LD~~ optical signal;

a <sup>photo diode</sup>  
a ~~PD~~ module for converting a photodiode optical signal to a <sup>photo diode</sup> ~~PD~~ electric signal;

a <sup>photo diode</sup>  
~~PD~~ electric signal conversion means for converting said PD electric signal to <sup>photo diode</sup> ~~PD~~ serial data;

a circuit board for carrying thereon said connector, said <sup>laser diode</sup> ~~LD~~ electric signal conversion means, said <sup>laser diode</sup> ~~LD~~ module and said <sup>photo diode</sup> ~~PD~~ module; and

a first and second frames for holding said circuit board, said <sup>laser diode</sup> ~~LD~~ module and said <sup>photo diode</sup> ~~PD~~ module,

wherein said fiber optic module includes a shielding member for shielding at least one of said <sup>laser diode</sup> ~~LD~~ and <sup>photo diode</sup> ~~PD~~ modules.

53. A fiber optic module as set forth in claim 52, wherein a shielding plate for exclusive use of said <sup>laser diode</sup> ~~LD~~ module and a shielding plate for exclusive use of said <sup>photo diode</sup> ~~PD~~ module.

54. A fiber optic module as set forth in claim 52, wherein at least one of said first and second frames is provided integrally with a shielding plate.

55. A fiber optic module comprising:  
a connector for connection with a mother

board;

a <sup>laser diode</sup>  
LD electric signal conversion means for  
converting serial data received from said mother board  
to an <sup>laser diode</sup> ~~LD~~ electric signal for a laser diode;

a <sup>laser diode</sup>  
an ~~LD~~ module for converting said <sup>laser diode</sup> ~~LD~~ electric  
signal to an <sup>laser diode</sup> ~~LD~~ optical signal;

a <sup>photodiode</sup>  
a ~~PD~~ module for converting a photodiode  
optical signal to a <sup>photodiode</sup> ~~PD~~ electric signal;

a <sup>photodiode</sup>  
~~PD~~ electric signal conversion means for  
converting said <sup>photodiode</sup> ~~PD~~ electric signal to <sup>photodiode</sup> ~~PD~~ serial data;

a <sup>laser diode</sup>  
a circuit board for carrying thereon said  
connector, said <sup>laser diode</sup> ~~LD~~ electric signal conversion means,  
said <sup>laser diode</sup> ~~LD~~ module and said <sup>photodiode</sup> ~~PD~~ module; and

a <sup>laser diode</sup> <sup>photodiode</sup>  
first and second frames for holding said  
circuit board, said <sup>laser diode</sup> ~~LD~~ module and said <sup>photodiode</sup> ~~PD~~ module,

wherein elastic pawls to be engaged with an  
optical fiber plug are provided to at least one of said  
first and second frames and said pawls are provided at  
their root parts with first projections extended toward  
the other frame.

56. A fiber optic module as set forth in claim 55,  
wherein second projections for protecting said first  
projections are provided to an opposite frame being  
opposite to the frame provided with said first  
projections.

57. A fiber optic module as set forth in claim 55,  
wherein said first and second frames and said pawls are  
made of resin material.

58. A fiber optic module comprising:

a connector for connecting with a mother board of a computer;

a first semiconductor integral circuit for converting a first parallel data provided from the mother board into a first serial data for a laser diode;

a second semiconductor integral circuit for converting said first serial data for the laser diode converted by said first semiconductor integral circuit into a first electrical signal;

a laser diode module including a laser diode for converting said first electrical signal for the laser diode into a first optical signal of the laser diode;

a photodiode module including a photodiode for converting a second optical signal received by said photodiode into a second electrical signal of the photodiode;

a third semiconductor integral circuit for converting said second electrical signal of the photodiode into a second serial data of the photodiode;

a fourth semiconductor integral circuit for converting said second serial data of the photodiode converted by said third semiconductor integral circuit into a second parallel data;

a circuit board for furnishing with said connector, said first semiconductor integral circuit, said second semiconductor integral circuit, said third

semiconductor integral circuit and said fourth  
semiconductor integral circuit;

a a first shielding plate for electrically  
shielding said <sup>laser diode</sup> LD module;

a a second shielding plate for electrically  
shielding said <sup>photodiode</sup> PD module;

a a first frame for holding said circuit board,  
said <sup>laser diode</sup> LD module and said <sup>photodiode</sup> PD module; and

a a second frame for cooperating with said first  
frame to hold said circuit board, said <sup>laser diode</sup> LD module and  
a <sup>photodiode</sup> PD module.